Climate of Eugene

I. Revision Notes.

This is the second revision of the Climate of Eugene, and provides data through early 2012. New additions to this study include data from the prior Eugene sites, dating back to 1890.

II. Geographical Overview.

Eugene is located at the upper end, or southern end, of the fertile Willamette River Valley. Mahlon Sweet Field, Eugene's airport, is the current location of the weather observation equipment. The airport is located roughly nine miles northwest of Eugene's city center.

Bounding the Willamette River Valley are the Cascades Range to the east and the Coast Range to the southwest and west, with low hills to the south. The Willamette River leaves the mountainous terrain at Eugene/Springfield area, and turns north. The Willamette Valley opens and broadens rapidly to the north of Eugene *(figures 1 and 2*).

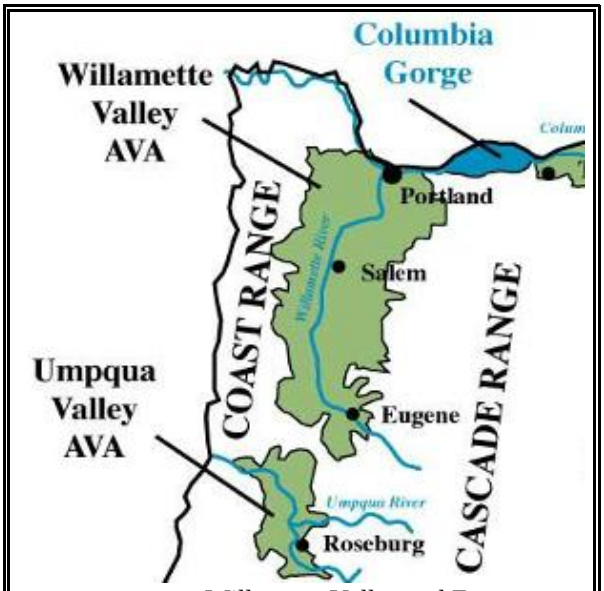

Figure 1: Willamette Valley and Eugene, showing geographical features of western Oregon.

The rolling wooded Coast Range begins ten miles west of Eugene, and rises from 1500 to 2500 feet above sea level. Fifty miles to the west, the Coast Range ends at the Pacific Ocean. To the east and northeast of Eugene lie the Coburg Hills, rising to 2500 feet above sea level. These are the beginning of the foothills of the Cascades. For the next 60 miles to the east lie the volcanic Cascade Range, with mountain passes near 5500 feet, but with individual volcanic peaks rising over 10,000 feet in elevation. Small valleys extend from the Willamette Valley into both the Coast Range and the Cascades. Abundant precipitation and moderate temperatures result in rapid growth of conifer trees, making lumbering and paper production a major industry. Much of the virgin timber has been harvested, but with rapid new growth of trees there is little bare ground in the mountains.

Figure 2: Willamette Valley and Eugene, showing topographic features of western Oregon.

III. Climatological Summary.

The Coast Range provides the Eugene area, with limited shielding from incoming storms from the Pacific Ocean. The Cascades offer a steep slope for orographic lift of moisture-laden westerly winds, resulting in moderate rainfall for the region. The Cascades also act as a barrier, preventing the colder continental air masses that originate in the arctic areas of Canada, from invading western Oregon. Occasionally, cold air does work its way into western Oregon via the Columbia River Gorge, filling the Willamette Valley.

Rain is a part of life during autumn and winter. Nearly 90 percent of the annual rainfall occurs between early October and mid-May. In fact, only about 2 percent of our rain occurs in July and August. It is not uncommon to see relatively dry, with no rain in both July and August. The first autumn rain often arrives about mid-September, but it generally is not until early October for the rain to increase in frequency. Rainfall varies significantly across the south Willamette Valley region. The Coast and the Cascade Ranges receive over 90 inches of rain per year, while the hills around the Eugene/Springfield area receive 50 to 70 inches. In the heart of the south Willamette Valley, where the Eugene airport is located, only about 40 to 50 inches falls annually (*figure 3*).

Precipitation falls mostly as rain, with an average of only four days per year recording measurable snow. Snow accumulations are rarely more than two inches, and often melt within a day. Most likely areas of snow will be the higher terrain above 900 feet (which includes the South Hills, and the Coburg Hills. Too many times, warm air pushing in from the Pacific quickly ends the threat of low elevation snow. However, occasionally, significant snow can occur, such as in January of 1969 when nearly four feet of snow fell.

The winter season is characterized by mild temperatures, frequent cloudy skies, and rain. Winds are predominately either southerly during the mild rainy spells, or northerly during the colder dry spells. Outbreaks of cold arctic air from east of the Cascades will occasionally spill into Western Oregon via the Columbia River Gorge, bringing chilly north winds. During these cold air events, if a moist Pacific front pushes into the region, rain will occur. Initially, the warm south winds will not be strong enough to scour out the cold air from the lowlands. As a result, the rain falls into the shallow layer of sub-freezing air, with freezing rain, sleet, and sometimes snow resulting. Often this phase is of short duration, with temperatures warming and ending the threat of freezing/frozen precipitation.

Temperatures are generally mild during the cool season, with highs in the middle 40s to lower 50s and lows in the 30s. It is common to see overnight winter low temperatures into 20s. During cold nights in winter, with an arctic air mass in place over the region, winds are often light under clear skies. This allows for rapid temperatures falls once the sun sets. At that time, temperatures can plummet below

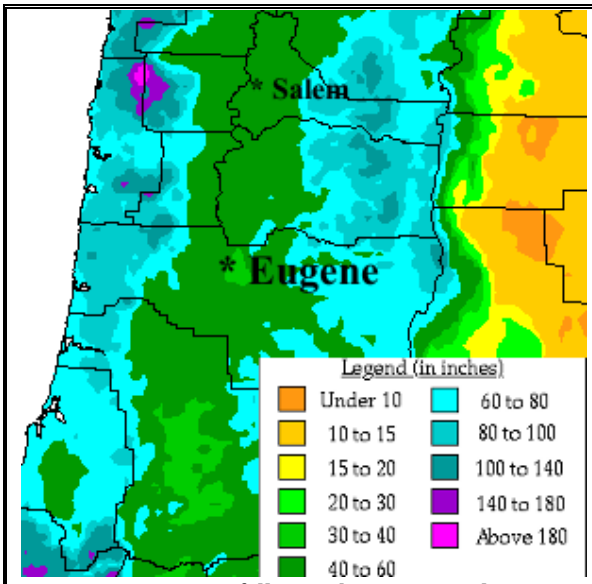

Figure 3 : Rainfall Distribution around Eugene.

20°F. Such cold temperatures are rare, averaging about twice per winter. The most notable cold snaps occurred in 1950 and 1972. During the 1972 cold snap, Eugene recorded its lowest temperature at 12°F below zero.

Spring is a transitional time as the weather pattern shift from winter to summer. However, spring is not all that warm, and often, not all that dry. March and April are often damp and cool, with only a few warm dry days. May and June turn more dry, and see the most of the warming weather. Generally, afternoon temperatures warm from the 60s/70s in May to the 70s/lower 80s in June. However, it is not uncommon to see temperatures into the 80s in April and May, with temperatures of 90°F or warmer in May. The warmest day in May was 95°F, occurring in 2008. Even though the number of rainy days decreases in May and June, there are still plenty of cloudy days, keeping daytime temperatures in the 70s.

Summer finally arrives in early July, when afternoon highs in the 80s occur with regularity. High pressure over the Pacific builds in the summer, with northerly winds prevailing in the afternoons and evenings. This high also shuts off the moisture source, allowing summers to often be dry and warm. Temperatures will often reach the lower to middle 90s, but these warm days do not last long before the cooler ocean air moves inland and cools the region back into the 70s. Temperatures above 100 degrees are rare, but usually occur in July and/or August. Hottest day ever in the Eugene/Springfield area was 108°F on 9 August 1981.

Autumn is the reverse of spring. September is still warm and dry, but by early to mid-October, fall arrives with high temperatures back into the 60s. As the night time hours increase, the valley cools more, allowing fog to form on clear nights. Fog can be quite dense during the late night and early morning hours, and can persist for several days.

Destructive windstorms are rare in Eugene, due to proximity of the hills to south and southwest. These hills act as a block for the strong southerly winds. The strong south winds blow aloft over the Eugene/Springfield area, but do surface to the Willamette Valley floor further north. Surface winds seldom exceed gale force (50 mph or greater) and have rarely exceeded 70 mph. Strongest winds occurred during the infamous Columbus Day storm of 1962, when south winds peaked at 86 mph. Second strongest wind event occurred in February 2002, when winds reached 70 mph.

Thunderstorms can occur during any month, but are not common. Thunderstorms in the winter and spring are weak, producing small hail and brief gusty winds. However, those in summer can produce prolific lightning, strong winds and larger hail. Occasionally, thunderstorms will produce funnel clouds, but tornadoes are rare.

On average, the last occurrence of 32 degrees in the spring is 24 April, while the first of autumn occurs near 25 October. However, temperatures of 32°F have occurred as late in spring as 13 June (in 1976) and as early in autumn as 23 September (in 2000).

IV. Station Observing History.

Eugene's weather records date back to October 1890, when a cooperative station was established. This station was maintained by the University of Oregon, which is located just southeast of downtown Eugene. Recorded weather data included temperatures, wind direction and snowfall. At the same time, a river and rainfall station was established

nearby on the Willamette River. This station recorded river levels, wind direction, snow depth and rainfall. However, weather observations at both sites were not continuous, with frequent gaps in the data occurring during the summer. Figure 4 shows the movement of Eugene's official observations sites, from 1 (the University of Oregon sites) to 4 (Mahlon Sweet Field, which is the present observation site).

The cooperative station was maintained at the University of Oregon site until April 1912. From 1912 through 1919, the station was moved to several locations, all on the University of Oregon campus *(see table 1).* In December 1919, the river and rainfall station was combined with the weather observation site, and relocated to 477 Third Avenue East.

The first major move of the Eugene observation site came on 11 September 1928, when the United States Weather Bureau (WB) opened a second-order weather station at the Eugene Airpark, which is located in southwest Eugene near the current location of the Lane County Fairgrounds. This new station operated only during the daylight hours, to assist the new airport operations. Starting in 1931, WB staff began hourly weather observations round the clock. The cooperative stations continue to record the daily temperature and precipitation records until it was closed in 1945.

Observation Sites	***Active Dates***
University of Oregon	Oct 1890-Apr 1912
533 East 10th Street	Apr 1912-Aug 1915
Kincaid Park	Aug 1915-Sep 1917
744 Mill Race Drive	Oct 1917-Nov 1919
477 Third Ave East	Dec 1919-Sep 1928
Eugene Airpark	Sep 1928-Nov 1942
Mahlon Sweet Field	Nov 1942-present

Table 1: History of Eugene Observation sites.

Figure 4: Eugene's official observation sites. Various University of Oregon(1890-1919), downtown (1919-1928), old Eugene airpark (1928-1942), and finally, Mahlon Sweet Field (1942-present).

On 22 November 1937, the United States WB established a first-order weather station. Staff now observed and recorded weather observations 24 hours per day. Primary reason for the new weather station was due to the increased air traffic between San Francisco and Seattle. Many of the aircraft needed to land and refuel between the two cities. Eugene, like Medford and Salem, became stopping points for aircraft. The new weather stations supplied weather information to pilots, making these pilot weather briefings a significant operation and the new offices. Old weather equipment was replaced, and other equipment such as wind anemometers and barometers were added. In addition to the pilot weather briefings and weather data collection, the new Eugene weather office issued regular public weather forecasts and if necessary, storm warnings, for all of Lane, Douglas, and Coos counties in Oregon.

With the completion of Mahlon Sweet Field (Eugene's new airport), weather records and observing equipment were moved to the new airport on 21 December 1942. Mahlon Sweet Field is roughly eight miles northwest of the Eugene airpark, and about 11 miles northwest of downtown Eugene. In 1987, the National Weather Service (formerly the WB) moved from the ground level to the second floor, which was the former airport control tower. The Federal Aviation Administration (FAA) vacated and relocated to the new Eugene tower, which was located with the new Mahlon Sweet Terminal building about one-eighth of a mile to the south.

National Weather Service (NWS) operations continued at Eugene through August 1995. On 1 September 1995, the Automated Surface Observing Station (ASOS) became fully operational. Weather forecasts, services and warning operations were transferred to the NWS office in Portland. Since September 1995, Eugene's weather observations have been generated by machine, with limited augmentation. Climate data continue to be collected, but snowfall was no longer measured due to ASOS inability to measure snowfall and snow depth.

Table below shows the basic movement and elevations of Eugene's weather equipment.

V. Updating this Study.

For future updates to the data in this study, refer to the latest climatic data published by the National Climatic Data Center, or contact the National Weather Service in Portland.

Eugene data is also available on our website:

http://weather.gov/Portland

Eugene Observation Equipment History and Locations	Occupied		DISTANCE MOVE (mile)	LATITUDE	LONGITUDE	Elevation (in feet) Above								
						Sea Level	Ground							
	FROM	TO				GROUND TEMPS	WIND EQUIPM	EXTREME TEMP	PSYCHROMETER	SUNSHINE	TIPPING BUCK	WEIGHING BUC	8 INCH RAIN	HYGROTHERM
Cooperative Sites														
U of O Campus	Oct 1890	Mar 1912	n/a	44°03'	123°05'	449		4					4	
533 East 10th St.	Apr 1912	13 Aug 1915	0.5 NW	44°03'	123°05'	449		4					4	
Kincaid Park	13 Aug 1915	Sept 1917	1.5 SE	44°03'	123°03'	550		4					4	
744 Mill Race Dr	Oct 1917	Nov 1919	1.5 SW	44°03'	123°05'	450		4					4	
477 Third Ave E	Dec 1919	30 Jun 1945	0.8 NW	44°03'	123°05'	450		4					4	
Airport Sites														
Airpark	11 Sep 1928	21 Dec 1942	2 SW	44°02'	123°07'	429	60	4	4				4	
UAL Building at Mahlon Sweet	21 Dec 1942	15 Jul 1953	7.8 NW	44°07'	123°13'	364	34	4	4			4	4	
Admin Building at Mahlon Sweet	15 Jul 1953	present	0.5 NE	44°07'	123°13'	361	53	4	4	-	-	3	3	-